

REMARKS

Overview of the Office Action

Claims 1, 6-9, 13, and 16 have been objected to because of various informalities.

Claims 1-4 and 14-16 have been rejected under 35 U.S.C. 103(a) as unpatentable over U.S. Patent 6,066,861 (“Hohn”) in view of U.S. Patent Appl. Pub. No. 2003/0032192 (“Haubold”).

Claim 5 has been rejected under 35 U.S.C. 103(a) as unpatentable over Hohn in view of Haubold, and further in view of U.S. Patent Appl. Pub. No. 2003/0057821 (“Fink”).

Claims 6, 8, and 10 have been rejected under 35 U.S.C. 103(a) as unpatentable over Hohn in view of Haubold, and further in view of U.S. Patent 6,241,819 (“Bhargava I”).

Claim 7 has been rejected under 35 U.S.C. 103(a) as unpatentable over Hohn in view of Haubold and Bhargava I, and further in view of U.S. Patent 6,391,273 (“Konrad”).

Claims 9 and 13 have been rejected under 35 U.S.C. 103(a) as unpatentable over Hohn in view of Haubold and Konrad, and further in view of U.S. Patent 7,175,77 (“Bhargava II”).

Claim 9 has been rejected under 35 U.S.C. 103(a) as unpatentable over Hohn in view of Haubold and Konrad, and further in view of U.S. Patent Appl. Pub. No. 2005/0077499 (“Cheetam”).

Claims 11 and 12 have been rejected under 35 U.S.C. 103(a) as unpatentable over Hohn in view of Haubold, and further in view of U.S. Patent Appl. Pub. No. 2003/0076454 (“Burroughes”).

Status of the claims

Claim 16 has been canceled.

Claims 1-2, 5-11, and 13-15 have been amended.

Claims 17-21 have been newly added.

Claims 1-15 and 17-21 are now pending.

Objection to claims 1, 6-9, 13, and 16

Claim 6 has been objected to because there is no indication of how low the absorption should be. Claim 6 has been amended to positively recite how low the absorption should be.

Claim 7 has been objected to because the limitation in the last paragraph has been interpreted as an optional occurrence and thus not necessary limitation. Claim 7 has been amended to remove the allegedly unnecessary limitation.

Claim 8 has been objected to because the descriptive points A50, FW50, FW70, and FW90 are not usually known phrases used by one skilled in the art. Claim 8 has been amended to either clarify, replace, or delete the descriptive points A50, FW50, FW70, and FW90.

Claim 9 has been objected to for being unclear. Claim 9 has been amended to clarify the claimed subject matter.

Claim 13 has been objected to because the composition of the nanophosphor is allegedly unclear. Claim 13 has been amended to clarify the composition of the nanophosphor.

Claim 16 has been objected to being a “use” claim. Claim 16 has been canceled.

Applicants submit that these rejections have been overcome.

Rejection of claims 1-4 and 14-16 under 35 U.S.C. § 103(a)

With respect to claim 1, the Office action states that the combination of Hohn and Haubold teaches all of Applicants' recited elements.

Independent claim 1 recites a luminescence-conversion LED, that includes "an LED chip emitting primary radiation with a peak wavelength in the range of 300 to 470 nm, the primary radiation being converted partly or completely into secondary longer-wave radiation by photoluminescence by at least one phosphor which is exposed to the primary radiation of the LED, wherein the at least one phosphor is a nanophosphor having a mean particle size d_{50} that lies in the range of 1 to 50 nm.

Hohn and Haubold, whether taken alone or in combination, fail to teach or suggest a luminescence-conversion LED, that includes an LED chip "wherein the at least one phosphor is a nanophosphor having a mean particle size d_{50} that lies in the range of 1 to 50 nm", as recited in Applicants' claim 1.

Hohn discloses a wavelength-converting casting composition that is based on a transparent epoxy casting resin with a luminous substance admixed. The composition of Hohn is used in an electroluminescent component having a body that emits ultraviolet, blue, or green light. An inorganic luminous substance pigment powder with luminous substance pigments is dispersed in the transparent epoxy casting resin of Hohn. The luminous substance is a phosphorous group of the general formula $A_3 B_5 X_{12} :M$, and the luminous substance pigments have particle sizes $<20 \mu m$ and a mean grain diameter $d_{50} <5 \mu m$ (see abstract of Hohn).

The Examiner concedes that Hohn fails to teach or suggest "wherein the conversion is achieved by the at least one phosphor having a mean particle size d_{50} that lies in the range of 1 to 50 nm (nanophosphor)", as recited in Applicants' claim 1.

The Examiner cites paragraphs [0001], [0004], [0130], [0133], and [0150] of Haubold as teaching a phosphor of a mean particle size of 1-50 nm that is capable of fluorescence and that the phosphor is used to achieve intense luminescent emission that environmentally insensitive.

The Examiner asserts that it would have been obvious to one skilled in the art to combine the phosphor of Haubold with the wavelength-converting casting composition of Hohn to achieve Applicants' recited invention. Applicants disagree, as there is nothing taught or suggested in Hohn or Haubold that would motivate one skilled in the art to combine these references to achieve Applicants' recited invention.

Haubold discloses methods for the preparation of inorganic nanoparticles capable of fluorescence, wherein the nanoparticles consist of a host material that comprises at least one dopant (see abstract of Haubold).

One of the technical effects of using a nanophosphor in a LED is that scattering in a medium is significantly reduced, which leads to higher efficiency (see paragraphs [0015] and [0018] of Applicants' specification).

According to Hohn, "the inorganic luminous substance YAG:Ce has the particular advantage, among others, that this involves insoluble color pigments with an index of refraction of approximately 1.84. As a result, along with the wavelength conversion, dispersion and scattering effects occur that lead to good mixing of blue diode emissions with yellow converter radiation" (see col. 3, lines 40-46 of Hohn).

The mixing between the blue diode emissions and yellow converter radiation is essential to the proper operation of the wavelength-converting casting composition of Hohn. The simple radiation mixing mechanism described by Hohn can only be achieved by using μm -phosphors, which, due to their particles size, effect high scattering of radiation.

In contrast, as described above, nanophosphors provide significantly reduced scattering of radiation as compared to μm -phosphors. Therefore, using nanophosphors in the wavelength-converting casting composition of Hohn would render the wavelength-converting casting composition inoperable. Thus, Hohn teaches away from using nanophosphors and a person skilled in the art would not be motivated in any way to substitute the μm -phosphors of Hohn with the nanoparticles of Haubold.

Furthermore, Haubold fails to teach or suggest how the nanoparticles could be applied to a luminescence-conversion LED as specifically recited in independent claim 1.

In view of the foregoing, Applicants submit that Hohn and Haubold, whether taken alone or in combination, clearly fail to teach or suggest the subject matter that is recited in Applicants' independent claim 1. Accordingly, claim 1 is deemed to be patentable over Hohn and Haubold under 35 U.S.C. §103(a).

Independent claim 16 has been canceled. Claims 14 and 15 have been amended to be in independent form and include limitations similar to claim 1 and are, therefore, patentable over Hohn and Haubold for at least those reasons discussed above with respect to independent claim 1.

Dependent claims

Claims 2-4, which depend from independent claim 1, incorporate all of the limitations of independent claim 1 and are, therefore, deemed to be patentably distinct over Hohn and Haubold for at least those reasons discussed above with respect to independent claim 1.

Rejection of claim 5 under 35 U.S.C. § 103(a)

The Office Action further states that the combination of Hohn, Haubold, and Fink teaches all of Applicants' recited elements in these claims.

Hohn and Haubold have been previously discussed and fail to teach or suggest the invention recited in Applicants' independent claim 1.

Because Hohn and Haubold fail to teach or suggest the entire subject matter recited in independent claim 1, and because Fink does not teach or suggest the recited subject matter of independent claim 1 that Hohn and Haubold are missing, the addition of Fink to the reference combination does not remedy the non-obviousness of claim 1.

Claim 5, which depends from independent claim 1, incorporates all of the limitations of independent claim 1 and is, therefore, deemed to be patentably distinct over Hohn, Haubold, and Fink for at least those reasons discussed above with respect to independent claim 1.

Rejection of claims 6, 8, and 10 under 35 U.S.C. § 103(a)

The Office Action further states that the combination of Hohn, Haubold, and Bhargava I teaches all of Applicants' recited elements in these claims.

Hohn and Haubold have been previously discussed and fail to teach or suggest the invention recited in Applicants' independent claim 1.

Because Hohn and Haubold fail to teach or suggest the entire subject matter recited in independent claim 1, and because Bhargava I does not teach or suggest the recited subject matter of independent claim 1 that Hohn and Haubold are missing, the addition of Bhargava I to the reference combination does not remedy the non-obviousness of claim 1.

Claims 6 and 8 have been amended to be in independent form and include limitations

similar to claim 1 and are, therefore, deemed to be patentably distinct over Hohn, Haubold, and Bhargava I for at least those reasons discussed above with respect to independent claim 1.

Claim 10, which depends from independent claim 1, incorporates all of the limitations of independent claim 1 and is, therefore, deemed to be patentably distinct over Hohn, Haubold, and Bhargava I for at least those reasons discussed above with respect to independent claim 1.

Rejection of claim 7 under 35 U.S.C. § 103(a)

The Office Action further states that the combination of Hohn, Haubold, Bhargava I, and Konrad teaches all of Applicants' recited elements in these claims.

Hohn, Haubold, and Bhargava I have been previously discussed and fail to teach or suggest the invention recited in Applicants' independent claim 1.

Because Hohn, Haubold, and Bhargava I fail to teach or suggest the entire subject matter recited in independent claim 1, and because Konrad does not teach or suggest the recited subject matter of independent claim 1 that Hohn, Haubold, and Bhargava I are missing, the addition of Konrad to the reference combination does not remedy the non-obviousness of claim 1.

Claim 7 has been amended to be in independent form and include limitations similar to claim 1 and is, therefore, deemed to be patentably distinct over Hohn, Haubold, Bhargava I, and Konrad for at least those reasons discussed above with respect to independent claim 1.

Rejection of claims 9 and 13 under 35 U.S.C. § 103(a)

The Office Action further states that the combination of Hohn, Haubold, Konrad and Bhargava II teaches all of Applicants' recited elements in these claims.

Hohn, Haubold, Konrad have been previously discussed and fails to teach or suggest the invention recited in Applicants' independent claim 1.

Because Hohn, Haubold, Konrad fail to teach or suggest the entire subject matter recited in independent claim 1, and because Bhargava II does not teach or suggest the recited subject matter of independent claim 1 that Hohn, Haubold, Konrad are missing, the addition of Bhargava II to the reference combination does not remedy the non-obviousness of claim 1.

Claim 7 has been amended to be in independent form and include limitations similar to claim 1 and is, therefore, deemed to be patentably distinct over Hohn, Haubold, Konrad and Bhargava II for at least those reasons discussed above with respect to independent claim 1.

Claims 9 and 13, which depend from independent claim 7, incorporate all of the limitations of independent claim 7 and are, therefore, deemed to be patentably distinct over Hohn, Haubold, Konrad, and Bhargava II for at least those reasons discussed above with respect to independent claim 7.

Rejection of claim 9 under 35 U.S.C. § 103(a)

The Office Action further states that the combination of Hohn, Haubold, Konrad and Cheetam teaches all of Applicants' recited elements in these claims.

Hohn, Haubold, and Konrad have been previously discussed and fail to teach or suggest the invention recited in Applicants' independent claim 1.

Because Hohn, Haubold, Konrad fail to teach or suggest the entire subject matter recited in independent claim 1, and because Cheetam does not teach or suggest the recited subject matter of independent claim 1 that Hohn, Haubold, Konrad are missing, the addition of Cheetam to the reference combination does not remedy the non-obviousness of claim 1.

Claim 7 has been amended to be in independent form and include limitations similar to claim 1 and is, therefore, deemed to be patentably distinct over Hohn, Haubold, Konrad and Cheetam for at least those reasons discussed above with respect to independent claim 1.

Claim 9, which depends from independent claim 7, incorporates all of the limitations of independent claim 7 and is, therefore, deemed to be patentably distinct over Hohn, Haubold, Konrad, and Cheetam for at least those reasons discussed above with respect to independent claim 7.

Rejection of claims 11 and 12 under 35 U.S.C. § 103(a)

The Office Action further states that the combination of Hohn, Haubold, and Burroughes teaches all of Applicants' recited elements in these claims.

Hohn and Haubold have been previously discussed and fail to teach or suggest the invention recited in Applicants' independent claim 1.

Because Hohn and Haubold fail to teach or suggest the entire subject matter recited in independent claim 1, and because Burroughes does not teach or suggest the recited subject matter of independent claim 1 that Hohn and Haubold are missing, the addition of Burroughes to the reference combination does not remedy the non-obviousness of claim 1.

Claims 11 and 12, which depend from independent claim 1, incorporate all of the limitations of independent claim 1 and are, therefore, deemed to be patentably distinct over Hohn, Haubold, and Burroughes for at least those reasons discussed above with respect to independent claim 1.

Newly added claims 17-21

Claims 17-21 have been newly added. Support for newly added claim 17 can be found in paragraph [0081] of Applicants' specification. Support for newly added claim 18 can be found in paragraph [0090] of Applicants' specification. Support for newly added claims 19-21 can be found in original claim 1 and 8.

As discussed in detail above, claim 1 is patentable over the cited references.

Claims 17 and 18, which depend from independent claim 1, incorporate all of the limitations of independent claim 1 and are therefore patentably distinct over the cited references for at least those reasons discussed above with respect to claim 1.

Claim 19-21 recite limitations similar to independent claim 1 and are, therefore, also patentable over the cited references for at least those reasons discussed above with respect to claim 1.


Conclusion

In view of the foregoing, Applicants respectfully request reconsideration, withdrawal of the rejections, and allowance of all of the now-pending claims.

Should the Examiner have any comments, questions, suggestions, or objections, the Examiner is respectfully requested to telephone the undersigned to facilitate a resolution of any outstanding issues.

Respectfully submitted,

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